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NVLAP Electromagnetic Compatibility and Telecommunications

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Contents

Foreword

The NIST Handbook 150 publication series sets forth the procedures, requirements, and guidance for the accreditation of testing and calibration laboratories by the National Voluntary Laboratory Accreditation Program (NVLAP). The series is comprised of the following publications:

- NIST Handbook 150, *NVLAP Procedures and General Requirements*, which contains the general procedures and requirements under which NVLAP operates as an unbiased third-party accreditation body;

- NIST Handbook 150-xx program-specific handbooks, which supplement NIST Handbook 150 by providing additional requirements, guidance, and interpretive information applicable to specific NVLAP laboratory accreditation programs (LAPs).

The program-specific handbooks are not stand-alone documents, but rather are companion documents to NIST Handbook 150. They tailor the general criteria found in NIST Handbook 150 to the specific tests, calibrations, or types of tests or calibrations covered by a LAP.

NIST Handbook 150-11, *NVLAP Electromagnetic Compatibility and Telecommunications*, presents the technical requirements and guidance for the accreditation of laboratories under the NVLAP Electromagnetic Compatibility and Telecommunications (ECT) LAP. The 2013 edition of NIST Handbook 150-11 supersedes and replaces all previous editions.

The handbook was revised with the participation of technical experts in the field of electromagnetic compatibility and telecommunications testing and was approved by NVLAP. The following main changes have been made to this handbook:

- content that was determined to be redundant with NIST Handbook 150 has been removed;
- clarifying text has been added to certain technical requirements to reduce ambiguity and improve understanding;
- identification of the minimum level and frequency of participation in proficiency testing activity required has been included, as well as the review of the participation and performance during the assessment and accreditation decision process;
- editorial revisions have been made to improve readability and consistency with other NVLAP publications, as well as minor technical revisions such as updating references and definitions.

Annex A (informative) provides a list of major ECT standards-issuing bodies, acronyms commonly cited, and the national economies for which the standards have been issued.

This handbook is also available on the NVLAP website, <http://www.nist.gov/nvlap>.

Questions or comments concerning this handbook should be submitted to NVLAP, National Institute of Standards and Technology, 100 Bureau Drive, Stop 2140, Gaithersburg, MD, 20899-2140; phone: 301-975-4016; fax: 301-926-2884; e-mail: nvlap@nist.gov.

Introduction

General

All electrical devices are potential sources of electromagnetic energy and are potentially affected by electromagnetic energy emitted from other electrical devices in their vicinity. These emissions may interfere with the performance and safe operation of a device. In fact, an electrical device is classified as either a non-intentional radiator, generating emissions as a by-product of normal operation (for example, a television or personal computer), or as an intentional radiator (for example, a citizens band radio or cell phone).

Electromagnetic Compatibility (EMC) is the ability of a device, product, or system to operate properly in its intended electromagnetic environment without degradation and without being a source of electromagnetic interference (EMI). As more sophisticated and sensitive electronic devices enter the marketplace, electromagnetic compatibility becomes more and more important.

In order to achieve EMC, governments set limits, and device manufacturers, including device purchasers, set requirements for the design, production, and operation of electronic systems that are electromagnetically compatible with their environments.

Types of requirements

In the United States, the U.S. Federal Communications Commission (FCC) sets requirements for various commercial and consumer electronic devices and systems. Commonly cited standards outside the United States include International Electrotechnical Commission (IEC) and Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference) (CISPR) standards.

With the global nature of trade, the devices manufactured must meet the EMC requirements of the economies in which they are sold. Governments, buyers, and manufacturers often cite international EMC voluntary standards. To meet this need NVLAP tracks and accredits to a list of test method requirements in the ECT LAP.

Some categories of standards have evolved from older application categories, including telephony and radio communications. As early as 1977, the International Organization for Standardization (ISO) began to develop its Open Systems Interconnection Basic Reference Model as an abstract description for communications and computer network protocol design, including physical standards, protocol standards, and interoperability standards. Also included are "harms to the network" test methods for wired telecommunications. Network Equipment Building System (NEBS) standards apply to the broad array of devices intended for the central office (CO) environment and procurements by Local Exchange Carriers (LECs), Competitive Access Providers (CAPs), Competitive Local Exchange Carriers (CLECs), Internet Service Providers (ISPs), and Access Service Providers (ASPs).

Some EMC requirements are based on the intended usage environment of the product, often more extreme than normal business and other public applications. For example, U.S. Military Standards (MIL-STD) 461/462 impose requirements for devices used in various ground, flight, and naval environments. Radio Technical Commission for Aeronautics, now RTCA, Inc., (RTCA) DO-160 test methods apply to devices dedicated to aeronautical environments.

Some standards that are not directly EMC standards, such as energy efficiency, product safety, and RF exposure, are also included in the ECT LAP.

History of the NVLAP ECT Program

The NVLAP ECT Program for FCC test methods was established in October 1985 in response to a request from five private-sector testing laboratories. The purpose of the program was to formally recognize laboratories found competent to perform testing in accordance with Title 47 of the U.S. Code of Federal Regulations (CFR) Part 15-Radio Frequency Devices and 47 CFR Part 68-Connection of Terminal Equipment to the Telephone Network. The program was expanded in 1988 in response to a request from the Naval Air Systems Command (NAVAIR) for the establishment and maintenance of adequate technical resources for MIL-STD-462 Acceptance Testing as part of the NAVAIR Search for Excellence program. The purpose of that part of the program is to assess and accredit laboratories that produce reliable test data for the U.S. military.

Present status of the NVLAP ECT Program

At the time of publication, this handbook covers test methods used to demonstrate compliance with FCC requirements given in 47 CFR, Telecommunication, Parts 0 through 101, the test methods in MIL-STD 461/462, the ANSI C63 standards, and the international standards IEC 61000-4-x series and CISPR product standards line (e.g., CISPR 11 and CISPR 22).

Other test methods used to demonstrate compliance with specific national standards for electromagnetic compatibility are also covered. These standards include, but are not limited to, Australia and New Zealand (AS/NZS) standards, Australian Communications and Media Authority (ACMA) Technical Specifications (TSs), Chinese National Standards (CNS), and Canadian Compliance Specifications (CS) 03. In addition, by virtue of a memorandum of understanding between NVLAP and the VCCI Council (VCCI) of Japan, NVLAP provides ISO/IEC 17025 accreditation of any electromagnetic compatibility-testing laboratory to the Normative Annex 1 Technical Requirements of Regulations (VCCI V-3) for voluntary control measures of VCCI.

Due to periodic updates and modifications to international, national, and regional requirements, users of this handbook should check frequently with the issuing bodies of the applicable standards and requirements for changes and additions. Please check the NVLAP website or contact the ECT Program Management on questions about specific standards for which accreditation is available or may be made available. Informative Annex A provides the names and acronyms of the common EMC standards organizations and, where applicable, the national economies for which the standards have been issued.

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1 General information

1.1 Scope of handbook

1.1.1 NIST Handbook 150-11 identifies the program-specific requirements and provides guidance for the accreditation of laboratories under the NVLAP Electromagnetic Compatibility and Telecommunications Laboratory Accreditation Program (ECT LAP). It supplements the NVLAP procedures and general requirements found in NIST Handbook 150, *NVLAP Procedures and General Requirements,* by tailoring the general criteria found in NIST Handbook 150 to the specific tests and types of tests covered by the ECT LAP.

1.1.2 NIST Handbook 150, this handbook, and their respective checklists (see 1.6) constitute the collective body of requirements that must be met by a laboratory seeking NVLAP accreditation for the ECT LAP.

1.1.3 This handbook does not contain the general requirements for accreditation. The general requirements are included in NIST Handbook 150. This handbook is intended for information and use by accredited ECT laboratories, assessors conducting on-site assessments, laboratories seeking accreditation, other laboratory accreditation systems, users of laboratory services, and others needing information on the requirements for accreditation under the ECT LAP.

1.2 Organization of handbook

The numbering and titles of the first five clauses of this handbook match those of NIST Handbook 150. The primary subclauses in clauses 4 and 5 (e.g., 4.1, 4.2, etc.) are also numbered and titled to correspond with those of NIST Handbook 150, even when there are no requirements additional to those in NIST Handbook 150.

1.3 Program description

The purpose of the ECT LAP is to accredit testing laboratories found capable and competent to perform EMC conformance testing to FCC, MIL-STD, IEC, EN, CISPR, and other test method standards that have been and may be added to the program.

The program includes standards for the testing of both intentional radiators (i.e., radio transmitters) and unintentional radiators (i.e., digital devices), as well as wireless and wired telecommunications products. The program also includes various test standards for conformance, performance, and/or interoperability. In addition, the program envelops test standards that are part of the FCC regulatory requirements associated with radio frequency (RF) safety.

The NVLAP ECT program includes test method standards for many areas including:

- Electromagnetic emissions;
- Electromagnetic immunity;
- Mil-Stds electromagnetic compatibility (emissions and susceptibility);

- Energy Star;
- Telecommunications;
- Radio conformance;
- Product Safety;
- RF Exposure.

Laboratories may seek accreditation in test methods in any of the areas listed above.

1.4 References

The following references are important for the application of this handbook. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

— NIST Handbook 150, *NVLAP Procedures and General Requirements*

— 47 U.S. Code of Federal Regulations (CFR) Telecommunication, Parts 0 through 101

— ISO 7637-2, *Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only*

— ISO/IEC 17043:2010, *Conformity assessment – General requirements for proficiency testing*

— ISO/IEC Guide 98-3:2008, *Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

— ISO/IEC Guide 99:2007, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

1.5 Terms and definitions

For the purposes of this handbook, the terms and definitions given in NIST Handbook 150, the terms and definitions given in the standards, for which the laboratory seeks accreditation, and the following terms, which are contained in ISO/IEC Guide 99 (2007) apply.

1.5.1
calibration
Operation that, under specified conditions, in a first step establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication. A calibration may be expressed by a statement, calibration function, calibration diagram, calibration curve, or calibration table. In some cases it may consist of an additive or multiplicative correction of the indication with associated measurement uncertainty.

1.5.2
uncertainty budget
Statement of a measurement uncertainty, of the components of that measurement uncertainty, and of their calculation and combination.

1.5.3
validation
Verification, where the specified requirements are adequate for the intended use.

1.5.4
verification
Provision of objective evidence that a given item fulfills specified requirements. When applicable, measurement uncertainty should be taken into consideration.

1.6 Program documentation

1.6.1 General

Assessors use NVLAP checklists and test method review summary forms to ensure assessment consistency. Checklists assist assessors in documenting compliance with the NVLAP requirements found in NIST Handbook 150, this handbook, and the specific test methods for which accreditation is requested. Checklists and test method review summary forms are part of the On-Site Assessment Report (see NIST Handbook 150). These documents are available on the NVLAP website, <http://www.nist.gov/nvlap>.

1.6.2 NIST Handbook 150 Checklist

All NVLAP programs use the NIST Handbook 150 Checklist, which contains the requirements published in NIST Handbook 150. The checklist items are numbered to correspond to clauses 4 and 5 and annexes A and B of NIST Handbook 150.

1.6.3 NIST Handbook 150-11 Checklist

The NIST Handbook 150-11 Checklist (also referred to as the ECT Program-Specific Checklist) addresses the requirements specific to electromagnetic compatibility and telecommunications testing given in NIST Handbook 150-11. Other checklists (such as Handbook 150-11A, a checklist for FCC Parts 2, 15, and 18) may apply and are available on the NVLAP website.

1.6.4 Test Method Review Summary

Because of the very large number of relevant standards and test methods in the ECT LAP, the assessor uses Test Method Review Summary forms, along with applicable checklists, to evaluate the laboratory's compliance to the test methods. The evaluation of the test methods by the assessor ranges from observing tests to having laboratory staff describe the test procedures. The assessor notes on the Test Method Review Summary form the depth into which each part of the test method was reviewed (Observed Test, Examined Apparatus, Walked/Talked Through Test, Listened to Description of Procedures).

1.6.5 NVLAP Lab Bulletins

NVLAP Lab Bulletins are issued to laboratories and assessors, when needed, to clarify program-specific requirements and to provide information about the most current program additions and changes. Lab

Bulletins providing additions or changes to the current program will supersede the requirements of the current published handbook until such time as the additions or changes are published in a revision of the handbook. Lab Bulletins are posted on the program-specific handbooks page of the NVLAP website.

2 LAP establishment, development and implementation

This clause contains no information additional to that provided in NIST Handbook 150, clause 2.

3 Accreditation process

3.1 General

An overview of the laboratory accreditation process is provided in NIST Handbook 150, clause 3, and includes information pertaining to application for accreditation; on-site assessment; proficiency testing; accreditation decision; granting accreditation; renewal of accreditation; changes to scope of accreditation; monitoring visits; and suspension, denial, revocation, and voluntary termination of accreditation.

3.2 Management system review

3.2.1 Prior to the on-site assessment, the lab is requested to provide a cross-reference document allowing a NVLAP assessor to verify that all requirements of clauses 4 and 5 and annexes A and B of NIST Handbook 150 and the corresponding NIST Handbook 150-11 are addressed in the management system documentation. The cross-reference document should verify that all requirements of this handbook and clauses 4 and 5 and annexes A and B of NIST Handbook 150 are addressed and their locations clearly identified in the management system documentation.

3.2.2 Prior to the on-site assessment, the assigned assessor will review all relevant management system documentation against NVLAP requirements, including the requirements of this handbook and NIST Handbook 150. During this review, the assessor may request additional management system documents and/or records, which will be returned upon request. Because of the very large number of relevant standards in the ECT LAP, relevant test method(s), operator instructions, and/or test procedures may be requested by the assessor for review in advance of the on-site assessment.

3.3 On-site assessment

3.3.1 General information

3.3.1.1 The purpose of the on-site assessment is to determine the laboratory's compliance with NIST Handbook 150, this handbook, and its own management system and to assess the capability and competence of the testing activities for which accreditation is being requested.

3.3.1.2 For laboratories that perform testing at locations other than the primary facility covered under the accreditation, these will be reviewed on a case-by-case basis to determine the extent of on-site review necessary.

3.3.1.3 Prior to the on-site assessment, the NVLAP assessor will provide a preliminary agenda. The laboratory shall be prepared to conduct test demonstrations, have equipment in good working order, and be ready for examination according to the requirements identified in this handbook, NIST Handbook 150, Handbook 150-11A Checklist (if applicable), and the laboratory's management system.

3.3.1.4 The laboratory shall make available all supporting technical information. All relevant documentation shall be provided to NVLAP and its assessors in English.

3.3.1.5 In addition to the checklists, to help assure the completeness, objectivity, and uniformity of the on-site assessment, the assessor uses the NVLAP Test Method Review Summary form to review the capability of the laboratory personnel to perform testing for which accreditation is sought. The test method review ranges from observing tests to having laboratory staff describe the test procedures. The assessor notes the depth to which each part of the test method was reviewed and records the results of the review.

3.3.2 Typical on-site assessment

3.3.2.1 Assessment activities

The NVLAP assessor performs the following activities during a typical on-site assessment:

a) Conducts an opening meeting with the laboratory to explain the purpose of the on-site visit and to discuss the schedule for the day(s). At the discretion of the laboratory manager, other staff may attend the meeting.

b) Reviews laboratory documentation not provided for review prior to the assessment, including the management system, equipment and maintenance records, record-keeping procedures, testing procedures, laboratory test records and reports, personnel competency records, personnel training plans and records, and safeguards for the protection of sensitive and proprietary information.

   At least one laboratory staff member shall be available to answer questions; however, the assessor may request to review the documents and records alone.

c) Physically examines equipment and facilities, observes the demonstration of selected procedures by the appropriate personnel assigned to conduct the tests, and interviews those personnel. The demonstrations requested may be selective or all-inclusive and shall include the use of sample test devices, preparation of the test device, and establishment of test conditions and the setup/use of major equipment. The assessor will also review the test data and examine the hardware/software for functionality and appropriateness.

d) Completes an On-Site Assessment Report, which contains the NVLAP On-Site Assessment Signature Sheet with Narrative Summary, NIST Handbook 150 Checklist, NIST Handbook 150-11 Checklist, NIST Handbook 150-11A Checklist (if applicable), and the Test Method Review Summary form.

   Comments in the report should be given serious consideration by the laboratory, but no action is mandated and changes are made at the laboratory's discretion. Comments are those areas of concern where a nonconformity may arise; however, no objective evidence is available to support citing a nonconformity. Historically, it has been noted that comments often rise to the level of nonconformities on subsequent assessments. As such, comments noted in the assessment will be

reviewed at the next on-site assessment to ensure that these issues have not risen to the level of nonconformities since the last on-site visit.

e) Conducts a closing meeting with the laboratory to explain the findings of the visit. At the closing meeting, the report shall be signed by the assessor and the laboratory's Authorized Representative to acknowledge the discussion of the outcome of the on-site assessment. The Authorized Representative's signature does not necessarily indicate agreement, and challenges may be made through NVLAP. The process for resolving nonconformities identified during the on-site is documented in NIST Handbook 150.

3.3.2.2 Proficiency testing

NVLAP does not organize a proficiency testing scheme for the ECT program. The laboratory shall assure the quality of tests in accordance with NIST Handbook 150-11, 5.9. The results of the quality assurance monitoring will be reviewed by the assessor during the on-site assessment.

3.3.3 Specific requirements for ECT on-site assessments

3.3.3.1 All laboratory equipment required to perform accredited testing, including equipment that is rented to perform testing, shall be available for assessment and in compliance with testing requirements. The assessor will physically examine equipment and facilities. This includes storage areas, shielded enclosures, open area test sites (OATS), anechoic and semi-anechoic chambers, pre-scan areas, test benches, electronics, test jigs, and antennas, as appropriate.

3.3.3.2 The laboratory shall have normalized site attenuation (NSA) measurement reports for all OATS and semi-anechoic chambers that are used for work under the NVLAP scope of accreditation and make these reports available to the assessor. The assessor will review these NSA measurement reports during the on-site assessment for adequacy and completeness. For test sites used for conducting tests above 1 GHz, the laboratory shall make available for review the results of the Site Voltage Standing Wave Ratio (SVSWR) for each test site.

3.3.3.3 For FCC CFR Part 68-Connection of Terminal Equipment to the Telephone Network, and other similar standards and regulations, an appropriate test artifact shall be used to demonstrate the test equipment.

3.3.4 Demonstrations

3.3.4.1 Assessor safety

The assessor may decline to observe a potentially hazardous test unless appropriate measures are taken.

3.3.4.2 Conducted and radiated emissions measurements

Demonstrations shall include the use of receivers and/or spectrum analyzers in shielded enclosures, pre-scan areas, OATS, and/or fully or semi-anechoic chambers.

3.3.4.3 Test site validation as part of demonstration

3.3.4.3.1 As part of the demonstration of measurement, an OATS or an alternative site, for testing performed below 1 GHz, shall be validated at least at three frequencies of measure in both horizontal and

vertical polarization at a single test distance. This information is recorded in NIST Handbook 150-11A, *ECT: FCC Parts 2, 15 and 18* Checklist.

For laboratories using outside services to perform normalized site attenuation (NSA), the capability to perform NSA shall be available during the on-site assessment.

3.3.4.3.2 For test sites used for conducting tests above 1 GHz, the laboratory shall make available for review the results of the Site Voltage Standing Wave Ratio (SVSWR) for each test site.

3.3.4.4 Demonstrations for multiple facilities

If the laboratory maintains more than one OATS and/or alternative site, the assessor will ask questions to determine whether all sites are operated and equipped such that the requirements of NVLAP, applicable regulatory bodies, and the test methods within the laboratory's scope of accreditation are met. Usually one site will be examined; however, at the discretion of the assessor, more than one site may be examined.

3.3.5 Nonconformity resolution

The laboratory shall resolve all nonconformities and provide a response to NVLAP within 30 days from the date of completion of the on-site assessment.

4 Management requirements for accreditation

4.1 Organization

There are no requirements additional to those set forth in NIST Handbook 150.

4.2 Management system

4.2.1 The laboratory shall ensure that the requirements of NIST Handbook 150 are met so that staff are knowledgeable of the electronic or paper-based documentation system and can demonstrate, if authorized, the retrieval of needed documents and/or records.

4.2.2 The laboratory shall have readily available the regulation(s) and the applicable version of the standard(s) for the test methods for which accreditation has been requested.

4.2.3 When a test method references another test method, guide, practice, or specification, which contains the procedure for the testing process, the laboratory shall have readily available the referenced documents.

4.3 Document control

The master list or document control procedure that identifies the current revision status and distribution of documents shall include all national and/or international standards on the requested scope of accreditation (see NIST Handbook 150, 4.3.2.1).

4.4 Review of requests, tenders, and contracts

All requests, tenders, and contracts shall be available for selection and examination by the assessor for the period of time covered between the on-site assessments.

4.5 Subcontracting of tests

There are no requirements additional to those set forth in NIST Handbook 150.

NOTE Subcontracting applies to any of the test methods on the scope of accreditation.

4.6 Purchasing services and supplies

There are no requirements additional to those set forth in NIST Handbook 150.

NOTE Laboratories should pay special attention to the purchasing of calibration services from calibration service providers. The technical requirements of the calibration shall be specified by the laboratory (per NIST Handbook 150, 4.6.3) as well as conformance to the appropriate traceability requirements in Annex B of NIST Handbook 150. Assessors will seek to determine that laboratory calibration records identify the measurement parameters, as well as the traceability chain for each parameter.

4.7 Service to the customer

There are no requirements additional to those set forth in NIST Handbook 150.

4.8 Complaints

There are no requirements additional to those set forth in NIST Handbook 150.

4.9 Control of nonconforming testing work

There are no requirements additional to those set forth in NIST Handbook 150.

4.10 Improvement

There are no requirements additional to those set forth in NIST Handbook 150.

4.11 Corrective action

There are no requirements additional to those set forth in NIST Handbook 150.

4.12 Preventive action

There are no requirements additional to those set forth in NIST Handbook 150.

4.13 Control of records

There are no requirements additional to those set forth in NIST Handbook 150.

4.14 Internal audits

4.14.1 The internal audit shall cover compliance with NVLAP accreditation requirements, the laboratory's management system, as well as regulatory, contractual, and testing requirements.

4.14.2 An applicant laboratory shall conduct at least one complete internal audit prior to the first on-site assessment. The records will be reviewed by the NVLAP assessor before or during the on-site assessment visit.

4.14.3 For accredited laboratories, records of internal audits conducted since the previous on-site assessment shall be made available for review.

4.15 Management reviews

4.15.1 An applicant laboratory shall perform at least one complete management review prior to the first on-site assessment. The records will be reviewed by the NVLAP assessor before or during the on-site assessment visit.

4.15.2 For accredited laboratories, records of management reviews conducted since the previous on-site assessment shall be made available for review.

5 Technical requirements for accreditation

5.1 General

There are no requirements additional to those set forth in NIST Handbook 150.

5.2 Personnel

There are no requirements additional to those set forth in NIST Handbook 150.

5.3 Accommodation and environmental conditions

5.3.1 FCC Part 15-Radio Frequency Devices: If a test site other than an OATS is used, a complete description shall be available along with documentation of equivalence.

5.3.2 All parts of the test site shall be operational and available for inspection during the on-site visit. The site attenuation shall be checked per ANSI C63.4 and complete written records shall be maintained. The site attenuation shall also be checked if significant changes are made in or near the OATS. This information will be reviewed during the on-site assessment visit.

5.3.3 FCC Part 68-Connection of Terminal Equipment to the Telephone Network: The laboratory shall have a procedure for checking the testing system before each use. This is especially important for automated systems. The laboratory shall have at least one telephone device reserved for use in periodic checks of the test system.

5.4 Test methods and method validation

Measurement uncertainty is addressed in different ways depending on the test method standards that are employed.

a) If measurement uncertainty can be calculated from Type A and B uncertainties, then the procedure shall follow the GUM or NIST Technical Note 1297 (see references in NIST Handbook 150, 1.4). Unless stated by the standard, the coverage factor (k) shall be equal to 2 (two) such that the confidence interval is approximately 95 %.

b) In some instances, the standard provides a measurement uncertainty budget as part of the test method. Examples include European Telecommunications Standards Institute (ETSI) standards concerning radio measurements. Each measurement uncertainty budget shall be supported with calibration and computational data applicable to the test method as performed by that laboratory.

c) In some instances, the standard provides a tolerance for the test method (and does not refer to "measurement uncertainty"). Examples include MIL-STD 461E:1999, 4.2.1 (d), which defines a ±3 dB tolerance for the measurement system (and an antenna to receiver tolerance of ±3 dB). The tolerance stated in the standard shall be supported by calibration data, measurement uncertainty budgets and/or other appropriate calculations.

d) In some instances, the standard provides a tolerance for the test components and/or instrumentation, but not for the test method. The tolerance shall be supported by instrument specifications, calibration and computational data, or comparison to some other appropriate measurement standard. At this time, there are no additional requirements beyond those in NIST Handbook 150, 5.4.6.2 - 5.4.6.3.

e) In all other cases, the requirements in NIST Handbook 150, 5.4.6.2 - 5.4.6.3 apply.

5.5 Equipment

5.5.1 Shielded enclosure

The laboratory shall specify how it monitors and records the performance of its shielded enclosure, how often, and what data shall be recorded. For example, any changes made in or near the shielded enclosure should warrant that the enclosure's performance be verified. Requirements for checking associated critical equipment, such as power line filters, and grounding systems shall also be specified and the results documented.

5.5.2 Line impedance stabilization networks

Line impedance stabilization networks (LISN) shall be calibrated for insertion loss and the impedance verified at least once per year.

5.5.3 Equipment that produce transient waveforms

Equipment that produce transient waveforms (i.e., ESD simulators, burst generators, surge generators, automotive transient generators [per ISO 7637-2], and similar equipment) shall be verified with an oscilloscope at least once per year and photographs of the waveform verification shall be kept on file.

NOTE The waveform verification is performed in accordance with NIST Handbook 150, 5.5.10 for intermediate checks. It is not intended to replace the calibration schedule for the instrument.

5.5.4 Software

Software associated with automated test equipment (either stand-alone or computer-controlled) shall be validated before use. This includes validation of any software updates from the original equipment manufacturer (OEM) or other source.

5.6 Measurement traceability

If a laboratory calibrates its own antennas, spectrum analyzers, and/or measurement receivers, procedures and instructions for those calibrations, in accordance with the manufacturer's calibration process and test method requirements, shall be maintained. Measurement uncertainties associated with these calibrations shall be estimated and reported in the calibration documentation. Antennas shall be calibrated to a recognized standard (e.g., ANSI C63.5, SAE ARP-958).

5.7 Sampling

There are no requirements additional to those set forth in NIST Handbook 150.

NOTE The requirements in NIST Handbook 150 for sampling pertain to a laboratory's selecting the sample to be tested. For most ECT test methods, the sample(s) is(are) selected by the laboratory's customer.

5.8 Handling of test items

There are no requirements additional to those set forth in NIST Handbook 150.

5.9 Assuring the quality of test results

5.9.1 The laboratory shall have procedures for the quality control activities performed to assure the validity of the tests. These procedures shall include predefined criteria.

NOTE 1 NIST Handbook 150, 5.9.1 identifies a number of monitoring methods that may be utilized to ensure the validity of tests. Laboratories could meet the requirements of section 5.9.1 by participation in proficiency testing or interlaboratory comparisons (ILCs), when available.

NOTE 2 NIST Handbook 150, 5.9.1 requires the resulting data to be recorded in such a way that trends are detectable and, where practicable, statistical techniques be applied to the review of the results.

5.9.2 The laboratory shall have a plan for monitoring the quality control activities performed. These activities are to be planned so that a minimum of one activity per year is performed, ensuring that each ECT category (reference section 1.3) of a laboratory's scope of accreditation is covered within four years.

5.9.3 Laboratories shall participate in proficiency testing when NVLAP announces plans to conduct a proficiency test.

5.9.4 The laboratory shall evaluate the quality monitoring results against the predefined criteria. The laboratory shall follow NIST Handbook 150, 4.9 for the control of nonconforming work, as well as section 4.11 for corrective action (where appropriate), whenever outliers are identified.

5.10 Reporting the results

There are no requirements additional to those set forth in NIST Handbook 150. Test methods, standards, specifies, customers, and regulators may have special reporting requirements.

6 Additional requirements

There are no additional requirements beyond NIST Handbook 150 and its associated normative annexes, and any other normative references cited in this handbook.

Annex A

(informative)

Information about selected ECT standards

Names, acronyms, and national economies of standards-issuing bodies for common ECT standards

Name of standard or standards body	Acronym	National economy
American National Standards Institute	ANSI	United States
Association of Radio Industries and Businesses	ARIB	Japan
ASTM International (formerly American Standards and Testing Materials)	ASTM	United States
Australian Communications and Media Authority	ACMA	Australia
Australian Communications Industry Forum	ACIF	Australia
Australian Standard/New Zealand Standard	AS/NZS	Australia and New Zealand
British National standard	BN	United Kingdom
British Standard	BS	United Kingdom
Broadcasting Equipment Technical Standards	BETS	Canada
Bureau of Standards, Metrology and Inspection	BSMI	Taiwan
Canadian Standards Association	CSA	Canada
Chinese National Standards	CNS	Taiwan
Comité European de Normalisation Electrotechnique (European Committee for Electrotechnical Standardization)	CENELEC	European Union
Directorate General of Telecommunications	DGT	Taiwan
Electronic Industries Alliance	EIA	United States
Environmental Protection Agency Energy Star	EPA Energy Star	United States
European Norms (European Standards)	EN	European Union
European Telecommunications Standards Institute	ETS or ETSI	European Union
Federal Communications Commission	FCC	United States
Federal Transit Administration (formerly the Urban Mass Transportation Administration)	FTA	United States
General Requirement (see Network Equipment Building System)	GR	
Hong Kong Telecommunications Authority	HKTA	Hong Kong
Infocomm Development Authority	IDA	Singapore

Name of standard or standards body	Acronym	National economy
Institute of Electrical and Electronics Engineers, Inc.	IEEE	
Interference-Causing Equipment Standard	ICES	Canada
International Electrotechnical Commission	IEC	
International Organization for Standardization	ISO	
International Telecommunications Union – Telecommunication Standardization Sector	ITU-T	
Korea Communications Commission	KCC	Korea
Korean Norms	KN	Korea
Korean Standards	KS	Korea
Military Standards	MIL-STD	United States
Ministry of Information and Communication	MIC	Korea
Network Equipment Building System	NEBS	United States
Public Land Mobile Network	PLMN	Taiwan
Public Switched Telephone Network	PSTN	Taiwan
Radio Standards Specification	RSS	Canada
Radio Telecommunications Terminal Equipment	RTTE	Taiwan
RTCA (formerly Radio Technical Commission for Aeronautics)	RTCA	United States
SEMI	SEMI	
Society of Automotive Engineers, Inc.	SAE	United States
Special International Committee on Radio Interference (see also IEC)	CISPR	
Telecommunications Industry Association	TIA	United States
Underwriters Laboratories, Inc.	UL	United States
Urban Mass Transportation Administration (now the Federal Transit Administration)	UMTA	United States
VCCI Council	VCCI	Japan

Enter Date: □□□□□ **Enter NVLAP Lab Code:** □□□□□

NIST HANDBOOK 150-11A CHECKLIST
ECT: FCC Parts 2, 15, and 18

(Based on the FCC Technical Assessment Evaluation Checklist - Feb 29, 2016)

Instructions to the Assessor: This checklist addresses specific criteria relating to accreditation of a laboratory to determine the capability and competence of that laboratory to perform tests to show compliance of equipment subject to the FCC EMC Regulations contained in 47 CFR Parts 2, 15, and 18. It is intended for use during the assessment phase of the accreditation process as a guide to evaluate the capability of the applicant laboratory facility and to determine the competency of the laboratory personnel for performing the required measurements. It is not intended to replace the good engineering judgment of the technical assessor or a thorough evaluation of the facility. Other points may and should be added to this checklist as the on-site assessment progresses.

Select one of the following for each item you observed and verified at the laboratory:

- Select the letter "Y", representing "yes" to show conformance with the criteria.
- Select the letter "N", representing "No", to show a nonconformity.
- Select "N/A" if the item is "Not Applicable."
- Record an explanation of any nonconformity or a comment in either the text box under each question or in the comments section at the end of the checklist.

I. DOCUMENTATION *(The laboratory should have copies of appropriate FCC rules, standards and measurement methods based on its scope of accreditation.)*

___ 1. ANSI C63.4-2003, *American National Standard for Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.*

___ 2. ANSI C63.4-2009, *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.*

___ 3. ANSI C63.4-2014, *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.*

□□□□□

___ 4. ANSI C63.10-2009, *American National Standard for Testing Unlicensed Wireless Devices.*

___ 5. ANSI C63.10-2013, *American National Standard for Testing Unlicensed Wireless Devices.*

___ 6. Is the testing laboratory familiar with *KDB Publications 789033* and *905462*, and capable of testing devices subject to all Unlicensed National Information Infrastructure policy and rule requirements?

___ 7. ANSI C63.17-2013, *American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices.*

□□□□□

___ 8. ANSI C63.19-2007, *American National Standard for Methods of Measurement of Compatibility Between Wireless Communication Devices and Hearing Aids.*

___ 9. ANSI C63.19-2011, *American National Standard for Methods of Measurement of Compatibility Between Wireless Communication Devices and Hearing Aids.*

□□□□□

___ 10. Is the testing laboratory familiar with *KDB Publication 285076* and capable of testing devices subject to Hearing Aid Compatibility (HAC) requirements for mobile handsets?

___ 11. ANSI/TIA-603-D-2010, *Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.*

□□□□□

___ 12. Is the testing laboratory familiar with *KDB Publication 971168* and capable of testing wideband devices operating in Commercial Mobile (Radio) Services?

□□□□□

___ 13. RF exposure KDB publications, in conjunction with the fundamental SAR concepts in IEEE Std 1528- 2013, *IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.* KDB publication requirements take precedence over any variations in IEEE Std 1528- 2013.

□□□□□

___ 14. Is the testing laboratory familiar with *KDB Publications 447498* and *865664* and capable of testing devices subject to general RF exposure guidance and SAR measurement guidance, respectively?

□□□□□

___ 15. FCC MP-5-1986*: Methods of measurement of radio noise emissions from Industrial, Scientific and Medical (ISM) equipment.*

□□□□□

___ 16. Does the testing laboratory possess or can demonstrate access to all FCC Rules and Regulations (47 CFR) and standards for the scope of the assessment?

□□□□□

___ 17. Are the measurement antennas properly calibrated in accordance with ANSI C63.5-2006?

□□□□□

___ 18. Is any measurement software used by the testing laboratory documented in the test report?

□□□□□

___ 19. For each type and size of EUT to be measured, does each radiated emission test facility comply with the conditions and requirements of the appropriate test procedure?

□□□□□

___ 20. Are LISN(s), filters, and isolation transformers, if used, properly installed? Is the LISN bonded to the ground reference plane?

□□□□□

___ 21. Does the radiated emission test site(s) meet the site validation requirements of 5.4 of ANSI C63.4-2014 for the frequency range of 30 MHz to 1 GHz?

□□□□□

___ 22. Does the radiated emission test site(s) meet the site validation requirements of *5.5 of* ANSI C63.4-2014 for the frequency range of 1 GHz 40 GHz?

□□□□□

___ 23. Does the radiated emission test site(s) meet the site validation requirements of CISPR 16-1-4:2010-04 for the frequency range of 1 GHz 40 GHz?

□□□□□

___ 24. Was the test site validation for performing radiated emissions measurements completed in the last three years?

□□□□□

___ 25. Does the EMI receiver or spectrum analyzer cover the required frequency range per the scope of accreditation for the measurements to be performed by the testing laboratory? (47 CFR § 15.33)

□□□□□

___ 26. Does the test laboratory have an up to date description of measurement facilities as required by 47 CFR § 2.948?

□□□□□

___ 27. Is the testing laboratory familiar with KDB Publication 935210 and capable of testing devices subject to signal booster requirements?

□□□□□

II. EMISSION TESTS

___ 28. Are the AC power-line conducted emission tests performed in accordance with the applicable parts of *ANSI C63.4-2014* and *47 CFR §§ 15.31-15.35 and 15.107*?

___ 29. Are the guidelines in ANSI C63.4 and FCC MP-5 followed for large EUTs, including *in-situ* measurements, if appropriate?

___ 30. Is the conducted emission test setup in accordance with ANSI C63.4 with the required separation between the EUT and any conducting surfaces maintained?

□□□□□

___ 31. Is the EUT connected to one LISN and all the peripherals connected to one or more LISNs or a power strip to one LISN; i.e., per ANSI C63.4- 2014?

___ 32. For each type of EUT, are measurements made over the correct frequency ranges and the correct detectors and bandwidth as required by 47 CFR §§ 15.33, 15.35, and 18.309?

___ 33. Are the radiated emission tests performed in accordance with the proper standard?

___ 34. Were radiated emission tests observed, and is the radiated emission test setup in accordance with proper standard?

___ 35. Are unintentional radiators, other than ITE, tested in accordance with the requirements in 47 CFR § 15.31 and the procedures in the appropriate standard?

___ 36. Are intentional radiators tested in accordance with the requirements in 47 CFR § 15.31 and the procedures in the appropriate standard?

□□□□□

___ 37. Does the radiated emission measurement represent the maximized cable configuration and worst case mode of EUT operation?

___ 38. For each type of EUT, are the correct frequency ranges investigated and the correct measurement detectors and bandwidth used per 47 CFR §§ 15.33 and 15.35?

□□□□□

___ 39. If the laboratory has a TEM waveguide, are the requirements followed in making radiated emission measurements using TEM waveguides? (ANSI C63.4, KDB Publication 823311)

III. TEST REPORTS *(Assessor should request to review several sample test reports for various types of products.)*

___ 40. Have several sample test reports for various types of products been reviewed for accuracy?

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___ 41. Does each of the test reports contain all the required information, and does the laboratory follow the report disposition procedure?

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___ 42. Does the test report reference the standard used and specify any deviations?

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___ 43. Is the rationale for selecting and arranging the EUT clearly stated, and are the components of the EUT system clearly identified?

___ 44. Does the test report include photographs or detailed sketches of the EUT configuration?

___ 45. Does the measurement report include a sample calculation with all conversion and correction factors used?

___ 46. Does the testing laboratory use external resources/subcontractors to perform testing, and if so do they have procedures in place to ensure that the external resources are properly accredited and FCC recognized?

___ 47. If external resources/subcontractors are used to perform testing, do the test reports clearly identify the work performed by the external resources/subcontractors and the results of the testing?

IV. PERSONNEL COMPETENCY (*The following is a list of general or lead-in questions, which are intended to be used as a guide to assess competency of laboratory personnel. Additional specific questions should be used to determine the technical competency of the personnel performing the measurement.*)

___ 48. Are laboratory personnel able to obtain recent FCC Rules and appropriate KDB guidance?

□□□□□

___ 49. Has each laboratory personnel responsible for testing been able to demonstrate performing a measurement of an applicable device?

___ 50. Do the test personnel know how to determine if an emission is from the EUT or is an ambient signal? Do the test personnel know how to handle an emission that is close to, or coincident with, an ambient signal?

___ 51. Can the test personnel explain the FCC requirements for testing a product in accordance with the requirements in 47 CFR §§ 15.31 to *15.35*? Are the test personnel knowledgeable of the FCC testing conditions for different types of products?

□□□□□

___ 52. Arrange for one of the laboratory personnel, at each type of site, replicate at least three frequency points on the horizontal site attenuation, and at least three frequency points on the vertical site attenuation. Is the test performed correctly, and is the site attenuation data at these frequencies consistent with the previously recorded data?

Note: Select frequencies from previous data that have both low and high deviations from the NSA.

___ 53. For equipment requiring RF exposure evalusation (SAR and MPE), are the test personnel knowledgeable of the test reduction, test exclusion, and measurement, or if applicable, numerical simulation procedures and requirements in KDB Publications?

□□□□□

___ 54. For measurements of equipment requiring Hearing Aid Compatibility (HAC) testing, are the test personnel knoweldgeable of the test setup and procedures?

□□□□□

Go to next page. ⟶

I hereby attest that at the time of assessment, the laboratory's technical capabilities met the aforementioned requirements based on a reasonable assessment sampling basis subject to effective corrective action for any nonconformities noted in the overall Accreditation Body (AB) reports of the assessment.

Assessor(s) Signature	***Date***

The FCC has developed the questions contained in this checklist to be used by the AB to assist in the assessment of EMC testing laboratories. The FCC also requires the AB to provide them with a copy of the completed checklist revealing the technical competence of the laboratory for the specific tests required by the FCC, and to meet APEC TEL MRA obligations. Please be advised that all information provided to the FCC will be made publicly available, as directed by the Freedom of Information Act (FOIA), unless a confidentiality request is submitted to the FCC with the recognition request pursuant to 47 CFR 0.457 and 0.459. Please note that failure to authorize NVLAP to submit this document to the FCC may result in the FCC's not recognizing your laboratory as an "Accredited" testing laboratory.

I hereby grant permission to NVLAP, providing this assessment, at the request of the FCC to release a copy of this completed checklist to the FCC.

Laboratory Authorized Representative Signature	***Date***

Continue to Annex A to complete site attenuation information.

NIST HANDBOOK 150-11A CHECKLIST
COMMENTS AND NONCONFORMITIES

Instructions to the Assessor: Use this sheet to document comments and nonconformities. For each, identify the appropriate item number from the checklist. Identify each comment with a "C" and each nonconformity with an "X." If additional space is needed, make copies of this page or use additional blank sheets.

Item No.	*C or X*	*Comments and/or Nonconformities*
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Annex A: SITE ATTENUATION INFORMATION	
Please complete the Site Attenuation information below during the on-site assessment.	
NSA measurement verification facility address:	
Site Description (i.e., 3 m, 10 m, OATS, Chamber):	

Transmit antenna height:				
Test distance:				
Frequency (MHz)	***Old Value (dB)*** *(Deviation from Theoretical NSA)*	***New Value (dB)*** *(Deviation from Theoretical NSA)*	***Polarization***	***Position***
			Vertical	
			Vertical	
			Vertical	
Transmit antenna height:				
Test distance:				
Frequency (MHz)	***Old Value (dB)*** *(Deviation from Theoretical NSA)*	***New Value (dB)*** *(Deviation from Theoretical NSA)*	***Polarization***	***Position***
			Horizontal	
			Horizontal	
			Horizontal	

Note: Acceptance value is +/- 4 dB from the theoretical value (C63.4-2003, Clause 5.4.6; C63.4-2009, Clause 5.4.4, *Site quality validation; C63.4:2014, Clause 5.4.4.2 Site acceptability criterion*).

NVLAP® National Voluntary Laboratory Accreditation Program

OMB No.: 0693-0003
Approval Expires:
November 30, 2018

GENERAL APPLICATION FOR NEW LABORATORIES

Instructions for completing the application for accreditation

1. To fill in and save this application form, you must have the latest version of the Adobe Reader software installed on your computer. This software is freely available from the Adobe Reader website.*

2. Thoroughly review the accreditation requirements published in NIST Handbook 150, *NVLAP Procedures and General Requirements*, and in the handbook of the Laboratory Accreditation Program(s) (LAP) for which you are applying. These requirements are published on the LAP webpage for each program. See http://www.nist.gov/nvlap/.

3. Complete this interactive fillable General Application Form by entering the requested information in each highlighted box or field. To move from one field to the next, press the Tab key.

4. The laboratory's Authorized Representative (AR) must sign page 4 of the General Application to signify agreement with the NVLAP Conditions for Accreditation.

5. Send this application to NVLAP at nvlap@nist.gov. It is recommended that you retain a copy for your records. Do not pay accreditation fees at this time. Payment of fees will be handled through the NVLAP Interactive Web System (NIWS).

6. NVLAP will email an acknowledgment to the AR, along with user account information, a link to the NIWS laboratory portal, and instructions for completing the remaining application steps through the NIWS.

7. For more information, go to NVLAP's website, http://www.nist.gov/nvlap/, and click on "Apply for Accreditation." For assistance, contact NVLAP by phone, (301) 975-4016; fax, (301) 926 2884; or email, nvlap@nist.gov.

* Software is identified in order to assist users of this information service. In no case does such identification imply recommendation or endorsement by the National Institute of Standards and Technology.

PAPERWORK REDUCTION ACT NOTICE

This collection of information contains Paperwork Reduction Act (PRA) requirements approved by the Office of Management and Budget (OMB). Notwithstanding any other provisions of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA unless that collection of information displays a currently valid OMB control number. Public reporting burden for this collection is estimated to average 3.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any aspect of this collection of information, including suggestions for reducing this burden, to Chief, Laboratory Accreditation Program, NIST, 100 Bureau Drive, Stop 2140, Gaithersburg, MD 20899-2140.

DATE :

NVLAP LAB CODE:

NVLAP GENERAL APPLICATION

1. **LEGAL NAME AND FULL ADDRESS** of the laboratory.

Laboratory Name

Address (Line 1)

Address (Line 2)

City | State | ZIP + 4

Foreign City | Foreign Postal Code

Country

2. **LABORATORY NAME AS YOU WANT IT TO APPEAR ON THE CERTIFICATE AND SCOPE OF ACCREDITATION**

DATE : _____ NVLAP LAB CODE: _____

3. **LABORATORY ACCREDITATION PROGRAM (LAP)** for which the laboratory is applying.

You may select more than one program.

- ☐ Acoustical Testing Services
- ☐ Asbestos Fiber Analysis
- ☐ Biometrics Testing
- ☐ Calibration Laboratories
- ☐ Carpet and Carpet Cushion
- ☐ Construction Materials Testing
- ☐ Efficiency of Electric Motors
- ☐ Electromagnetic Compatibility &Telecom.
- ☐ Energy Efficient Lighting Products
- ☐ Fasteners and Metals
- ☐ Ionizing Radiation Dosimetry
- ☐ ITST: Common Criteria Testing
- ☐ ITST: Cryptographic & Security Testing
- ☐ ITST: Healthcare Information Tech. Testing
- ☐ Personal Body Armor
- ☐ Radiation Detection Instruments
- ☐ Thermal Insulation Materials
- ☐ Voting System Testing
- ☐ Wood-Based Products

4. **AUTHORIZED REPRESENTATIVE** of the laboratory. The Authorized Representative is responsible for ensuring that the laboratory complies with the conditions and criteria for accreditation. This person's name will appear in NVLAP directories and on Scopes of Accreditation. The Authorized Representative will receive all NVLAP correspondence, receive proficiency testing materials and reports, and be contacted about on-site assessments.

Name: _____

Title: _____

Phone No.:_____ Fax No.: _____

E-Mail: _____

DATE : [ ]

NVLAP LAB CODE: [ ]

CONDITIONS FOR ACCREDITATION

To become accredited and maintain accreditation, a laboratory shall agree in writing to comply with the following NVLAP conditions for accreditation:

a) comply at all times with the NVLAP requirements for accreditation as set forth in NIST Handbook 150 and relevant technical documents, including any changes to those requirements;

b) fulfill the accreditation procedure, especially to receive the assessment team and allow access to information, documents, and records;

c) when the laboratory conducts activities at clients' sites, have arrangements to provide access to the assessment team;

d) pay the fees charged to the applicant laboratory as determined by NVLAP, and maintain relevant financial agreements;

e) participate in proficiency testing as required;

f) follow NVLAP conditions for referencing accreditation status (see Annex A and Annex E);

g) resolve all nonconformities;

h) report to NVLAP within 30 days any significant changes relevant to its accreditation, in any aspect of its status or operation relating to:

- legal, commercial, organizational, or ownership status,
- organization, top management, or ley personnel, including Authorized Representative and Approved Signatories,
- main policies,
- resources and location, including equipment, facilities, and working environment, where significant,
- scope of accreditation, or
- other matters that may affect the laboratory's ability to comply with the requirements of NIST Handbook 150 and/or relevant technical documents;

i) return to NVLAP the Certificate of Accreditation and the Scope of Accreditation should it be requested to do so by NVLAP.

In addition to the confidentiality provisions of NIST Handbook 150 paragraph 1.7, NVLAP (administered by NIST) and the laboratory seeking accreditation acknowledge and agree that the accreditation assessments and proficiency testing work done by NIST/NVLAP is done in accordance with the authority granted to NIST by Title 15 United States Code Section 3710a. The Parties further agree that to the extent permitted by law, NIST will protect information obtained during application, on-site assessment, proficiency testing, evaluation, and accreditation from disclosure pursuant to Title 15 USC 3710a(c)(7)(A) and (7)(B) for a period of five (5) years after it is obtained.

For the first five years that laboratory information is held by NVLAP, both confidentiality provisions will be in force — NIST Handbook 150 and 15USC3710a. Information in NVLAP's possession for more than five years will continue to be held in confidence under the provision of NIST Handbook 150.

As the applicant laboratory's **Authorized Representative**, I agree to the above conditions for accreditation. I attest that all statements made in this application are correct to the best of my knowledge and are made in good faith.

Signature_____ Date _____

Printed Name _____

A-Z NVLAP Assessor Biographical Summaries

Michael Cantwell has been a NVLAP Assessor since 2003. He is a licensed Professional Engineer (PE) and National Association of Radio and Telecommunication (NARTE) certified electromagnetic compatibility (EMC) Engineer. A known expert in the field of EMC, Mr. Cantwell has built and managed several EMC laboratories across the United States. He is a senior member of the Institute of Electronics and Electrical Engineers (IEEE) and a member of its EMC and Product Safety Societies. He currently holds the position of Global Regulatory Compliance Manager for Unicom Engineering in Plano, TX.

Thomas Dickten is an electrical engineer with over 25 years of experience in the fields of electromagnetic compatibility (EMC) and electrical safety. He is an expert in FCC, Industry Canada, Occupational Safety & Health Administration (OSHA), Japanese, Hong Kong and European testing requirements. In addition to serving as a Lead Assessor for multiple accreditation organizations including NVLAP, A2LA, and DAkkS (German Accreditation Body), Mr. Dickten operates Global Compliance Consulting, a California-based consultation firm specializing in Regulatory Compliance.

Daniel Hoolihan, M.S. is a physicist with over 40 years of experience in electromagnetic compatibility (EMC) engineering. Between 1969 and 2000, Mr. Hoolihan worked as Vice-President of TUV America Minnesota, Chief Operating Officer of AMADOR corporation and Scientist at Control Data Corporation. He is a Life Senior Member of the Institute of Electronics and Electrical Engineers (IEEE), having been a member since 1983. Once past-president of the EMC Society of the IEEE, Mr. Hoolihan now serves as the Chair of the History Committee of the Society. In addition to his duties as an independent consultant and EMC trainer, Mr. Hoolihan has worked as an NVLAP Assessor since 2004.

Victor Kucyzynski, M.S. is an electrical engineer, owner and President of Vican Electronics located in Toronto, Canada. He is an ISO/IEC 17025 qualified technical and lead assessor for testing and calibration laboratories in the fields of electromagnetic compatibility (EMC), telecommunications, radio frequency (RF) and microwave, electrical and environmental. He is a National Association of Radio and Telecommunication (NARTE) certified electromagnetic compatibility (EMC) Engineer. In addition, Mr. Kucyzynski has been a member of the Accredited Standards Committee C63® since 1996 and an Institute of Electronics and Electrical Engineers (IEEE) member since 1987.

Adeniyi Salam, P.E., Ph.D. is an electrical engineer, owner and Chief Technical Officer of Infinite Outlook, LLC where he serves as a national and international consultant for EMC testing, radio frequency (RF) measurements, microwave testing and calibration. He is a National Association of Radio and Telecommunication (NARTE) certified electromagnetic compatibility (EMC) Engineer and Certified Reliability Engineer (CRE). He has over 30 years of electrical engineering experience attained as an engineer at IBM, Nortel, Electric Power Authority, RELTEC Corporation, Marconi Communications and Panasonic.

Mitsunobu Samoto is an electronics engineer with over 30 years in the electromagnetic compatibility (EMC) testing industry. He is a National Association of Radio and Telecommunication (NARTE) certified EMC Engineer and Life Member of the Institute of Electronics and Electrical Engineers (IEEE). Before establishing his own company, Samoto & Associates, Ltd., Mr. Samoto served as Director and Manager of Riken Teletech Corporation, which designs and constructs EMC test facilities. He is also credited with establishing EMC business operations for two Japanese companies, Stauffer Japan Ltd. And Kashima Industries Company. Currently, Mr. Samoto acts as Chairman of Samoto & Associates, Ltd., while operating as a NVLAP Assessor.

Werner Schaefer, M.S. Mr. Schaefer is the owner and principal engineer at Schaefer Associates, a consulting firm, in Novato, CA. He has over 30 years of experience in the areas of radio frequency (RF) and wave test equipment design and calibration, metrology and electromagnetic compatibility (EMC) and RF/microwave measurements as well as quality system development and implementation. Mr. Schaefer has authored over 55 publications on

RF/microwave and other electromagnetic compatibility EMC topics. He began performing NVLAP assessments in 2007 in the fields of EMC and telecommunications.

Daniel Sigouin is an electrical engineer and subject matter expert in radiocommunication, telecommunications, electrical safety and product safety conformance. He has over 30 years of experience in electromagnetic compatibility (EMC) testing and radio standards development, much attained from his work at the Canadian Federal Government's Department of Communications. He is the current Vice Chair of the Accredited Standards Committee C63® while participating in working groups for C63.4, C63.5, C63.10, C63.25 and C63.26 method development. Mr. Sigouin has been an accreditation assessor for over 10 years.

Yukio Tanuma is an electrical engineer and current Representative Director of PCTEST Japan Co, Ltd. He has held the positions of Chief Engineer at NMi Japan Co. Ltd., EMC Manager of PCTEST Engineering Laboratory Inc. and Group Leader of the Electromagnetic Compatibility (EMC) department of Akzo Kashima Ltd. His expertise includes EMC, radio, specific absorption rate (SAR), hearing aid compatibility (HAC), battery safety, CDMA and LTE conformance/OTA. Mr. Tanuma is a National Association of Radio and Telecommunication (NARTE) certified electromagnetic compatibility (EMC) Engineer. He has been performing NVLAP assessments of laboratories since 1997.

David Waitt is an electrical engineer and computer scientist based in San Jose, CA. Having worked in the regulatory field for 20 years and as an electromagnetic compatibility (EMC) assessor for over 10 years, Mr. Waitt has extensive knowledge and experience in EMC, radio frequency (RF), specific absorption rate (SAR), safety, and battery testing. His work experience includes engineering positions at California Microwave, Metricom Inc. and Handspring. Now an independent regulatory consultant, Mr. Waitt specializes in helping manufacturing companies meet international regulatory requirements while also operating as a NVLAP assessor.

Derek Walton is an electrical engineer and owner of L.F Research which provides EMC Design Consulting and testing services to small businesses. Prior to starting L.F. Research, he worked as a senior engineer at Barber-Coleman Industrial Instruments, Honeywell and Sundstrand. He has extensive experience (30 years) in the EMC industry, serves on numerous committees, has authored papers and holds a number of patents. Mr. Walton is also a NARTE Certified EMC Engineer, a recognized AEMCLRP and Bluetooth Assessor (BTA), and past Chairman of IEEE EMC Society Chicago Chapter.

David Zimmerman is President of Spectrum EMC Consulting, LLC. He has over 30 years of experience in the electromagnetic compatibility (EMC) field. He has been a National Association of Radio and Telecommunication (NARTE) certified electromagnetic compatibility (EMC) Engineer since 2002 and a member of the Institute of Electronics and Electrical Engineers (IEEE) since 1997. Mr. Zimmerman is also a member of the Radio Technical Commission for Aeronautics (RTCA) and the C63® Electromagnetic Compatibility Main Committee. He has been a Lead Assessor for NVLAP since April 2012.

DRAFT

Procedure for the transition a NVLAP designation of a testing laboratory (to the FCC) to the Designating Authority (DA) of a new Telecom MRA Partner

Introduction

NVLAP is recognized by the FCC as a Test Firm Accrediting Body (TFAB) to designate U.S. testing labs and labs in the following specific non-MRA countries: TBD.

In the event that an MRA becomes operational between the U.S. and a current non-MRA country for which NVLAP has been recognized, it will be necessary for NVLAP to transition the designation process to the Designating Authority (DA) of the new Telecom MRA partner. This procedure describes the basic steps that NVLAP will take to transition the designation.

Transitioning Designation

NVLAP will work with appropriate U.S. government agencies (USTR, FCC, NIST) to obtain the relevant information on the transition dates for when the new MRA Partner DA will assume the designation function.

NVLAP will notify, in writing, all of its accredited testing laboratories within that country to inform them that NVLAP will no longer be able to designate their laboratory to the FCC as of a certain date.

Following guidance given by the FCC, NVLAP will withdraw the relevant designations at the appropriate time, providing all cooperation necessary.

Acceptance of NVLAP Accreditation by new MRA Partner

If NVLAP's accreditation will be accepted by the new Telecom MRA Partner DA, this information will be provided to the laboratories as well.

NVLAP will arrange to be recognized by the foreign MRA partner if this is a necessary step.

Should the foreign MRA partner not accept NVLAP accreditation for the designation of the labs in their country, NVLAP will communicate to its accredited laboratories that NVLAP accreditation will not be accepted and it will be necessary for the lab to obtain accreditation from the AB specified by the new MRA Partner.

NVLAP will provide the necessary contact information to the labs so that they may obtain more information from their country authorities.

APLAC

Asia Pacific Laboratory Accreditation Cooperation

APLAC MUTUAL RECOGNITION ARRANGEMENT

AN ARRANGEMENT TO GRANT RECOGNITION

Having fulfilled the requirements of the APLAC Mutual Recognition Arrangement, **NVLAP, United States of America** is a signatory to the Arrangement.

APLAC MRA signatories:

(i) use equivalent procedures under ISO/IEC 17011 in the accreditation of laboratories against ISO/IEC 17025, medical laboratories against ISO 15189 and inspection bodies against ISO/IEC 17020;

(ii) recognise, within the scope of recognition of this MRA, the accreditation of a laboratory or inspection body by other signatories as being equivalent to an accreditation by its own organisation;

(iii) recommend and promote the acceptance by users in their economies of endorsed test, calibration and inspection reports issued by laboratories and inspection bodies accredited by APLAC MRA signatories;

(iv) investigate complaints initiated by a signatory resulting from test reports and calibration certificates issued by their accredited testing and calibration laboratories and/or inspection reports issued by their accredited inspection bodies; and

(v) inform one another, as soon as possible, of any significant changes in the status and/or operational practices in their accreditation bodies.

Accreditation Body: National Voluntary Laboratory Accreditation Program

Economy: United States of America

Scope of Recognition: Testing/Calibration

Date of Signing APLAC MRA: 19 November 1997

A J Russell
APLAC Chair

Inter American Accreditation Cooperation

Be it known that the

National Voluntary Laboratory Accreditatoin Program (NVLAP)

UNITED STATES OF AMERICA

has been accepted as a Member of the

Inter American Accreditation Cooperation

Multi-lateral Recognition Arrangement

For

Accreditation Bodies of Testing and Calibration Laboratories (ISO/IEC 17025)

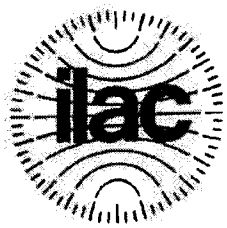
The Member on behalf of which this sheet is signed is committed to complying with the requirements and obligations of the IAAC MLA.

Sally Bruce
Chief of NVLAP

Beatriz García
IAAC Chair

Mauricio Soares
IAAC MLA
Committee Chair

Signed in San Jose, Costa Rica, on September 4th, 2009.
Approval date: August 30th, 2009.



ILAC MUTUAL RECOGNITION ARRANGEMENT

SIGNATORIES

We, the undersigned, endorse the terms of the ILAC Arrangement and undertake, to the best of our ability, fulfillment of its objectives.

Accreditation Body: National Voluntary Laboratory Accreditation Program (NVLAP)

Economy: USA

Scope: Testing & Calibration

Authorized Representative: David Alderman

Signature: _____ Date: 02-11-00
David Alderman

Chairman, ILAC Arrangement Council:

Signature: _____ Date: 02-11-00
Belinda L. Collins, PhD

Annex G

Description of NVLAP's on-site assessment intervals and renewal process

Overview

This annex provides a description of NVLAP's on-site assessment intervals in the context of the renewal process, along with an illustrative example for a fictional laboratory (Laboratory ABC).

NVLAP accreditation is valid for one year. An accreditation will expire after one year unless it is renewed by the laboratory.

An initial accreditation may be granted during any time of the year. When NVLAP determines that the laboratory has met all requirements for accreditation, the NVLAP chief grants the accreditation. The expiration date of the initial accreditation must be one of four dates (December 31, March 31, June 30, or September 30), chosen to be the closest to 12 months from the accreditation's effective date. Therefore, a laboratory's annual accreditation period is one of the following: January 1 through December 31; April 1 through March 31; July 1 through June 30; or October 1 through September 30.

Prior to the expiration date of the initial accreditation period, the laboratory applies for renewal of its accreditation. NVLAP reviews the documentation provided by the laboratory with its application (a surveillance activity), as well as information from the previous on-site assessment. If the laboratory continues to meet the accreditation requirements, NVLAP renews the accreditation and schedules another on-site assessment to be performed as soon as possible during the second period of accreditation. NVLAP can only schedule the on-site assessment after the laboratory's renewal application is received and the on-site assessment fee is paid.

Note: NVLAP is a U.S. federal government accrediting body and is subject to the government procurement regulations. Therefore, NVLAP cannot legally assign an assessor or schedule the on-site assessment of a laboratory until the accreditation fees have been collected with a laboratory's application to NVLAP.

For these reasons, the renewal timeline for a NVLAP laboratory may appear to be confusing to those unfamiliar with the process. In actuality, an on-site assessment is performed well in advance of the next renewal date. The decision whether or not to renew an accreditation is based upon the on-site assessment that took place within the 12-month period preceding the decision.

When the renewal application, including supporting documentation and appropriate accreditation fees, is received, NVLAP takes the appropriate steps as shown in the following illustration. After the second period of accreditation (described above in the third paragraph), a full reassessment occurs every two years.

Illustration of a laboratory renewal timeline

Laboratory ABC first applied for accreditation on 15 March 2014 and the first on-site assessment was performed on 1 June 2014. Initial accreditation was granted on 1 August 2014 with an expiration date of 30 June 2015. NVLAP could not schedule a second on-site assessment until after the fees for the second assessment could be collected with the next application (due before the expiration date of 30 June 2015).

Therefore, the second on-site assessment was scheduled, in accordance with NVLAP policy as stated in NIST Handbook 150, 3.2.3.3, as soon as possible after 1 July 2015. As soon as the on-site fee was collected, NVLAP assigned an assessor and scheduled an on-site visit during what NVLAP terms "the first renewal year" (see table below). The on-site assessment was completed on 15 September 2015, and the laboratory maintained its accreditation.

As shown, the on-site conducted on 15 September 2015 was the requisite on-site for the renewal cycle beginning 1 July 2016 (not 1 July 2015), since NVLAP, as a federal government body, must collect the fees for an on-site assessment BEFORE the assessment can be scheduled and conducted. In this example, the fees were collected just prior to the cycle with the beginning date of 1 July 2015 so that the on-site assessment could be conducted within the time window beginning 1 July 2015 and ending 30 June 2016. This allows the laboratory to be renewed on 1 July 2016. The process repeats every other year and allows NVLAP to conduct full reassessments at intervals not exceeding 2 years in compliance with ISO/IEC 17011: 2004, 7.11.3.

Illustration of a laboratory with a July renewal cycle

Accreditation Period	Accreditation Activities
1 August 2014 to 30 June 2015 (year #1 – initial accreditation period)	← 15 March 2014: Initial application received. ← 1 June 2014: Initial on-site assessment completed. ← 1 August 2014: Initial accreditation granted based upon documentation review and on-site assessment completed on 1 June 2014. ← 7 May 2015: Annual application and fees were received in order for accreditation to be renewed on 1 July 2015. The fees collected also included the fee for the second full on-site assessment to be conducted during the time period of 1 July 2015 to 30 June 2016, in order that the lab might be renewed on 1 July 2016. (Fees must be collected in advance of the performance of the on-site assessment.)
1 July 2015 to 30 June 2016 (year #2 - first full renewal year – see NIST Handbook 150, 3.2.3.3)	← 1 July 2015: Accreditation is renewed based upon documentation review (a surveillance activity). ← 15 September 2015: Full on-site assessment is completed, which IS required for next renewal on 1 July 2016. ← 3 May 2016: Annual application and fees were received in order for accreditation to be renewed on 1 July 2016. No on-site assessment fee was collected since on-site was performed on 15 September 2015.

Accreditation Period	Accreditation Activities
1 July 2016 to 30 June 2017	← 1 July 2016: Accreditation is renewed based upon documentation review AND completion of on-site assessment on 15 September 2015. ← 8 May 2017: Annual application and fees were received in order for accreditation to be renewed on 1 July 2017. The fees collected also included the fee for an on-site assessment to be conducted during the time period of 1 July 2017 to 30 June 2018, in order that the lab might be renewed on 1 July 2018. (Fees must be collected in advance of the performance of the on-site assessment.)
1 July 2017 to 30 June 2018	← 1 July 2017: Accreditation is renewed based upon documentation review (a surveillance activity). Renewal did not require an on-site during the previous 12 months. ← 1 September 2017: On-site assessment is completed, which IS required for next renewal on 1 July 2018. ← 4 May 2018: Annual application and fees were received in order for accreditation to be renewed on 1 July 2018. No on-site assessment fee was collected since on-site was performed on 1 September 2017.
1 July 2018 to 30 June 2019	← 1 July 2018: Accreditation is renewed based upon documentation review AND completion of the on-site assessment on 1 September 2017. ← 24 May 2019: Annual application and fees were received in order for accreditation to be renewed on 1 July 2019. The fees collected also included the fee for an on-site assessment to be conducted during the time period of 1 July 2019 to 30 June 2020, in order that the lab might be renewed on 1 July 2020. (Fees must be collected in advance of the performance of the on-site assessment.)
1 July 2019 to 30 June 2020	← 1 July 2019: Accreditation is renewed based upon documentation review (a surveillance activity). Renewal did not require an on-site during the previous 12 months. ← 12 September 2019: On-site assessment is completed, which IS required for next renewal on 1 July 2020. ← 7 May 2020: Annual application and fees were received in order for accreditation to be renewed on 1 July 2020. No on-site assessment fee was collected since on-site was performed on 12 September 2019.